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field of explosives is well given in the preface: to bring together more closely the science and practise of the subject; to establish a closer cooperation between the scientist and the technologist. In this the author has succeeded most remarkably well. The important modern explosives are carefully reviewed and arranged according to chemical and physical views now held. Theoretical and mathematical discussions have been omitted, which makes the book valuable to the technologist who as a rule has troubles enough without trying to keep in practise on advanced mathematics.

In chapter one there is given a clear outline of the elementary principles relating to the general behavior of explosives. Chapters two, three and four treat of velocity, temperature and pressure produced by explosives on combustion. An excellent discussion of the products of explosive reactions as influenced by temperature and pressure is given in chapter five. Chapter six treats of intensity and velocity of the explosive impulse. Chapter seven is of special importance to miners and ordnance officers since it treats of the flame of an explosion. Igniters, fuses, detonators and fulminates are described in chapter eight. In chapter nine there is a brief but excellent discussion of black and smokeless powders. Blasting explosives in chapter ten are fully discussed, including hints for handling, use and destruction of explosives generally.

A valuable feature of the book is the splendid list of references to literature on explosives and related subjects. The work, which on the whole is excellent, has lost nothing by translation. Works of this character are frequently ruined by translators, either on account of lack of knowledge of the foreign language or unfamiliarity of the subject. In this case the translators show a thorough knowledge of German, and surely Dr. Munroe is more familiar with explosives than any one else in this country. It is gratifying to note that attention is called to the fact that the term "nitroglycerine" is not in accordance with present-day chemical nomenclature. Why not discard also the name "nitrocellulose"? The

latter is a nitrate just as much as the former. On page 161 in equation one there should be shown six carbon dioxids instead of two, and on page 162 where the decomposition of picric acid is shown six molecules, not two, of hydrogen are formed. Nothing further remains to be said except that no explosives library is up to date without this work.

A. P. SY

NOTES ON METEOROLOGY AND CLIMATOLOGY

THE SOLAR CONSTANT OF RADIATION

VOLUME III. of the Annals of the Astrophysical Observatory of the Smithsonian Institution has just appeared (a great quarto volume of 241 pages). As a result of recent investigations of the intensity of solar radiation, these noteworthy results have been obtained: (1) That the mean value of the solar constant of radiation for the epoch 1905-1912 is 1.929 calories per square centimeter per minute; (2) an increase in the solar constant by 0.07 calories per square centimeter per minute is accompanied by an increase of 100 in sun-spot numbers; (3) numerous, almost simultaneous measurements of the solar constant at Mount Wilson, California, and at Bassour, Algeria, would indicate that the intensity of solar radiation experiences an irregular change which frequently exceeds 0.07 calories per square centimeter per minute and which follows a ten-day period; (4) indications of two entirely independent phenomena makes it reasonable to believe that the variations in the solar constant are caused by the sun itself and probably not by meteoric dust or other phenomena between the sun and earth.¹

WEST INDIA HURRICANES

IN a recent Weather Bureau bulletin entitled "Hurricanes of the West Indies," Professor Oliver L. Fassig gives the results of a thorough

¹ C. G. Abbot, F. E. Fowle and L. B. Aldrich, "Die Solarkonstante und ihre Schwankungen," *Meteorologische Zeitschrift*, pp. 257-261, June, 1913.

² Bulletin X., U. S. Weather Bureau, March 29, 1913, quarto, 28 pp., 25 plates.

investigation of 134 West India hurricanes occurring in the 36 years 1876-1911. The area visited by these storms includes the Gulf of Mexico, the Caribbean Sea and the tropical ocean for a few hundred miles east of the West Indies and Florida,—thus the routes leading to and from the Panama Canal on the Atlantic side will lie for a great distance in the heart of the hurricane zone. There are two main hurricane paths, one following the inside Gulf Stream route and the other the line of the northward Atlantic drift off the north and east coasts of the Greater Antilles and Florida. The former is most frequented by the cyclones in June and July and the latter in August, September and October. In these last three months 88 per cent. of the 134 cyclones occurred. Their tracks are normally parabolic, open to the east. The average rate of movement on the first branch (northwestward) and during the "recurve" (northward), is 11 miles per hour. On the second branch (moving northeast) the mean velocity increases to 16 miles per hour. The mean duration was 5.8 days (maximum 19, minimum 1 day). The number of West India hurricanes in the 20 years 1880-1899 was 86, as against 418 typhoons in the west Pacific and 184 cyclones in the Bay of Bengal during the same period. Professor Fassig considers West India hurricanes as mainly the result of general atmospheric movements and not of local differences in temperature. When in summer the equatorial belt of calms has moved some distance north of the equator, the deflective action of the earth's rotation is sufficient to produce a cyclone when an adequate initial impulse comes from the somewhat conflicting trade winds north and south of the doldrums.

HUMIDITY AND FROST DAMAGE

PROFESSOR A. G. McADIE in the *Monthly Weather Review* for April, 1913, in an article entitled "Frost Studies—Determining Probable Minimum Temperatures," points out that in frost damage to plants the relative humidity of the air is a very important factor. For instance, in the frost of January 4-7, 1913, in

southern California the dryness of the air favored rapid radiation and evaporation, causing damage to plants not only on account of the low temperature but also through serious interference with proper plant functions, especially in connection with transpiration, which became injuriously rapid.

On another page of this number, Mr. E. S. Nichols, local forecaster at Grand Junction, Colo., in connection with a damaging frost on April 23 also calls attention to the fact that on dry frosty nights greater injury is done than on moist ones with equal air temperatures. He has accordingly warned fruit-growers in his district to begin smudging on dry frosty nights at higher temperatures than on damp ones.³

CLOUDINESS AND SUNSHINE OF NORTH AMERICA

AN important contribution to the climatology of North America entitled "Bewölkungsverhältnisse und Sonnenscheindauer von Nordamerika," by Arthur Gläser, has recently appeared.⁴ The area covered is limited on the north on account of lack of observations to include only southern Canada. There are three general regions where the mean annual cloudiness is in excess of 60 per cent.—around Puget Sound, the Great Lakes and the Canadian Maritime Provinces. A minimum of less than 20 per cent. occurs in the region about the lower Colorado River in southwestern Arizona and southeastern California. This relative distribution in general remains the same throughout the year. Maximum cloudiness for southern and eastern United States and the Pacific coast including the Great Basin comes in winter; for the Great Plains, in spring; for New Mexico, Arizona, most of Mexico and Florida, in summer; and for the country roughly north of latitude 43 degrees and east of the one hundredth meridian, in November. Minimum cloudiness comes in winter over central Canada; in spring over most of Mexico

³ See also E. A. Beals, "Forecasting Frost in the North Pacific States," *Weather Bureau Bull.* No. 41, 1912.

⁴ Aus dem *Archiv der Deutschen Seewarte*, XXXV., 1912, Nr. 1, quarto, 63 pp., 22 figs., 7 charts.

and Florida; in summer throughout northern United States and the Great Basin; and in fall over the California coast, central Rockies, southern and eastern United States. The duration of sunshine is about the reverse of the cloudiness indicated, for the cloudiness records are practically only from observations in the daytime.

Previous cloudiness charts for the United States were published (1) in 1890 by General A. W. Greely, of the Signal Service; (2) in 1898 by the Weather Bureau;⁸ (3) in 1911 by K. McR. Clark.⁹

AUSTRALIAN METEOROLOGY

THE Australian Weather Service has recently published new monthly and annual temperature and rainfall charts of Australia and Tasmania based on observation series from twenty to forty years in length. These charts correspond closely with earlier ones except that the annual isotherms sweep north in the center of Australia instead of south and the isohyts show the rainfall in greater detail. An annual rainfall of less than 5 inches is indicated in South Australia and as high as 140 inches on the Queensland coast. Commonwealth Meteorologist H. A. Hunt has invented a novel rotary diagram called a "rainfall clock," which indicates in a striking manner the progressive monthly changes of Australian rainfall.

The remarkable constancy and regularity of Australian weather has led Mr. Hunt to suggest the foundation of international meteorological observatories there for purposes of research in the fundamental problems of dynamic meteorology.[†]

NOTES

HOFERAT PROFESSOR DR. JULIUS VON HANN writes that a third edition of his great "Lehrbuch der Meteorologie" will soon begin to ap-

⁸ Report of the Chief of the Weather Bureau, 1896-97.

⁹ *Quarterly Journal of the Royal Meteorological Society*, April, 1911, pp. 169-175.

[†] See *Nature*, London, Vol. 91, pp. 355, 435-436, 489.

pear. It is coming out in sections to make its purchase easier. He expects the work to be complete in the fall of 1914. The first edition appeared in 1901 and the second in 1906. From 1908-1911 Dr. von Hann published the third edition of his great "Handbuch der Klimatologie" in three volumes. These two magnificent works are second to none in the realm of meteorology and climatology.

THE Royal Academy of Holland has conferred the Buys-Ballot Medal on Dr. H. Hergesell in recognition of his service in the investigations of the upper air in the subtropics and arctic, and as head of the International Commission for Scientific Aeronautics. In 1903 this medal was conferred on Professors Assmann and Berson, and in 1893 on Dr. von Hann.

DIRECTOR M. A. RYKATCHEW, of the Nicholas Central Physical Observatory, at St. Petersburg, retired on May 7, after having served 46 years, of which the last 17 were as director.

In the report of the Chief of the Weather Bureau for 1911-12, recently issued, mention is made of preparations for proposed anemometer tests by Professor C. F. Marvin, now Chief. A whirling machine with an arm thirty feet long and capable of producing wind velocities up to 70 or 80 miles per hour will be used. There will be tests carried on also in a "wind tunnel" through which with blowers a current of air exceeding 100 miles per hour can be forced. These tests are for the purpose of correcting the standard Weather Bureau anemometers to record true wind velocities instead of some 18 per cent. too high as in the past and at present.

CHARLES F. BROOKS

BLUE HILL METEOROLOGICAL OBSERVATORY

SPECIAL ARTICLES

THE REDISCOVERY OF PERIDERMIIUM PYRIFORME PECK

THE name *Peridermium pyriforme* was proposed by Peck in 1875 for a blister rust growing "on pine limbs in the spring, Newfield, New Jersey." In his original description Peck laid emphasis on the form of the spores which he described as "obovate, pyriform, or oblong-